Calhoun: The NPS Institutional Archive

DSpace Repository

Theses and Dissertations | 1. Thesis and Dissertation Collection, all items

2002-06

Framing the force protection problem an application of knowledge management

Koy, Andrew Bruen

Monterey, California. Naval Postgraduate School

http://hdl.handle.net/10945/5894

This publication is a work of the U.S. Government as defined in Title 17, United States Code, Section 101. Copyright protection is not available for this work in the United States.

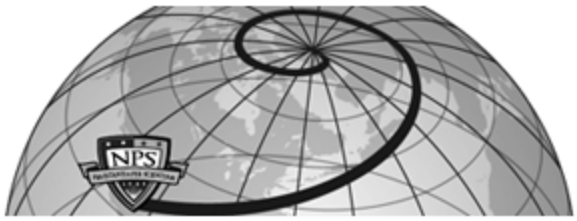
Downloaded from NPS Archive: Calhoun

http://www.nps.edu/library

Calhoun is the Naval Postgraduate School's public access digital repository for research materials and institutional publications created by the NPS community. Calhoun is named for Professor of Mathematics Guy K. Calhoun, NPS's first appointed -- and published -- scholarly author.

Dudley Knox Library / Naval Postgraduate School
411 Dyer Road / 1 University Circle
Monterey, California USA 93943

Calhoun
Institutional Archive of the Naval Postgraduate School



Author(s)	Koy, Andrew B.
Title	Framing the force protection problem an application of knowledge management
Publisher	Monterey, California. Naval Postgraduate School
Issue Date	2002-06
URL	http://hdl.handle.net/10945/5894

This document was downloaded on February 04, 2015 at 09:49:19

DUDLEY KNOX LIBRARY

http://www.nps.edu/library

Calhoun is a project of the Dudley Knox Library at NPS, furthering the precepts and goals of open government and government transparency. All information contained herein has been approved for release by the NPS Public Affairs Officer.

Dudley Knox Library / Naval Postgraduate School
411 Dyer Road / 1 University Circle
Monterey, California USA 93943

NPS PRAESTANTIA PER SCIENTIAM 1909

http://www.nps.edu/

NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

FRAMING THE FORCE PROTECTION PROBLEM:
AN APPLICATION OF KNOWLEDGE MANAGEMENT

by

Andrew Bruen Koy

June 2002

Thesis Advisor:	Erik Jansen
Second Reader:	Shelley Gallup

Approved for public release; distribution is unlimited.

THIS PAGE INTENTIONALLY LEFT BLANK

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.			
1. AGENCY USE ONLY ***(Leave blank)***	**2. REPORT DATE** June 2002	**3. REPORT TYPE AND DATES COVERED** Master's Thesis	
4. TITLE AND SUBTITLE: Title (Mix case letters) FRAMING THE FORCE PROTECTION PROBLEM: AN APPLICATION OF KNOWLEDGE MANAGEMENT			**5. FUNDING NUMBERS**
6. AUTHOR(S) Andrew Bruen Koy			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000			**8. PERFORMING ORGANIZATION REPORT NUMBER**
9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES) NCIS, Institute for Defense Systems Engineering and Analysis, Multi-Threat Alert Center			**10. SPONSORING/MONITORING AGENCY REPORT NUMBER**
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.			
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited			**12b. DISTRIBUTION CODE**

13. ABSTRACT ***(maximum 200 words)***

Using knowledge management and knowledge flow theories, personnel involved in force protection can better construct a trustworthy threat assessment of a port region. By ensuring that intelligence agents, regional experts, and force protection officers are linked in a knowledge flow system, our fleet's decision makers will be equipped with the proper tools to better prepare for port visits. A new organization, the Multi-Threat Alert Center, will be a vital organization that is charged with doing most of the knowledge construction in this system. Therefore its construction and implementation into the AT/FP organization is paramount to maintaining a successful system. Its ultimate knowledge product will be used by commands conducting port visits as the main assessment of the current threat conditions. A key component to ensuring that due diligence is maintained while using pre-fixed force protection plans is to ensure that knowledge is treated as a dynamic system instead of a static object. By analyzing the MTAC knowledge flow systems with current theories, the planners and organizers of force protection can ensure that a functioning and efficient system is in place.

14. SUBJECT TERMS Force Protection, Knowledge Management, Absorptive Capacity, Multi-Threat Alert Center, Institute for Defense Systems and Engineering Analysis, Anti-Terrorism			**15. NUMBER OF PAGES** 61
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	**18. SECURITY CLASSIFICATION OF THIS PAGE** Unclassified	**19. SECURITY CLASSIFICATION OF ABSTRACT** Unclassified	**20. LIMITATION OF ABSTRACT** UL

NSN 7540-01-280-5500 Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18

THIS PAGE INTENTIONALLY LEFT BLANK

Approved for public release; distribution is unlimited.

FRAMING THE FORCE PROTECTION PROBLEM: AN APPLICATION OF KNOWLEDGE MANAGEMENT

Andrew B. Koy
Ensign, United States Navy
Bachelor of Science in Computer Science
United States Naval Academy, 2001

Submitted in partial fulfillment of the
requirements for the degree of

**MASTER OF SCIENCE IN
INFORMATION SYSTEMS AND OPERATIONS**

from the

**NAVAL POSTGRADUATE SCHOOL
June 2002**

Author: Andrew Bruen Koy

Approved by: Erik Jansen
Advisor

Shelley P. Gallup
Reader

Dan C. Boger
Chairman, Department of Information Systems

THIS PAGE INTENTIONALLY LEFT BLANK

ABSTRACT

In order to appraise the current terrorist and force protection threat against US Naval forces, trust in the creation of such countermeasures must be grounded in knowledge creation and management theories and practices. The anti-terrorism and force protection (AT/FP) problem involves identifying the different threats associated with particular global regions and then disseminating those threats to the appropriate decision makers. This requires that leaders gain knowledge about these regions and craft appropriate warnings and plans. The Multi-Threat Alert Center is being established as the hub for this knowledge flow process. Its organization and mission will be critical for the effectiveness of any US response to AT/FP. By using theories such as the "Knowledge Management Life Cycle Models" and concepts such as "absorptive capacity," Multi-Threat Alert Center (MTAC) planners can better address the larger problem of knowledge creation and management. This is accomplished by ensuring that processes found in the AT/FP plan support knowledge flow and help increase the absorptive capacity of the organization. This paper identifies key knowledge creation and flow concepts, outlines a proposed AT/FP system, and applies the theory to this application. This thesis is intended to spur further research in the knowledge management fields and its application to the MTAC and AT/FP systems.

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

I. INTRODUCTION 1
A. BACKGROUND 1
B. ORGANIZATION OF THE PAPER 3

II. ANTI-TERRORISM/ FORCE PROTECTION KNOWLEDGE SYSTEM 5
A. STAKEHOLDERS AND ORGANIZATIONS 5
1. Multi-Threat Alert Center 5
2. NCIS Agents 6
3. Force Protection Officers 7
4. Immediate Superior in Command 8
B. PROBLEMS ASSOCIATED WITH THE MTAC 9
C. SUMMARY 10

III. KNOWLEDGE MANAGEMENT FRAMEWORKS 13
A. THE KNOWLEDGE MANAGEMENT LIFE CYCLE MODELS 13
1. Knowledge Defined 13
2. Knowledge Management 16
3. Knowledge Creation 17
B. USE OF KNOWLEDGE BASED SYSTEMS 19
C. PROCESS ANALYSIS AND REPRESENTATION 20
1. Horizontal Scope Analysis 20
2. Vertical Scope Analysis 21
3. Contextual Analysis 22
D. KNOWLEDGE SYSTEMS AND ABSORPTIVE CAPACITY 23
1. Absorptive Capacity Overview 23
2. Dimensions of Absorptive Capacity 23
a. Acquisition 23
b. Assimilation 24
c. Transformation 25
d. Exploitation 25
E. SUMMARY 26

IV. KNOWLEDGE FLOW AND FORCE PROTECTION 27
A. KNOWLEDGE MANAGEMENT LIFE CYCLE AND FORCE PROTECTION (THE SCHACHER PROPOSAL) 27
B. USE OF KNOWLEDGE BASED SYSTEMS IN FORCE PROTECTION 29
C. SCHACHER PROCESS ANALYSIS AND REPRESENTATION 31
1. Horizontal Scope Analysis 31
a. Tacit to Explicit Knowledge Flow 31
b. Explicit to Explicit Knowledge Flow 32
c. Explicit to Tacit Knowledge Flow 32
d. Tacit to Tacit Knowledge Flow 33

2. Vertical Scope Analysis 33
3. Contextual Analysis 34
D. KNOWLEDGE SYSTEMS AND ABSORPTIVE CAPACITY 35
1. Acquisition 35
2. Assimilation 36
3. Transformation 36
4. Exploitation 36
E. SUMMARY 37
V. CONCLUSION 39
A. SUMMARY OF KNOWLEDGE FLOW SYSTEMS 39
B. FUTURE RESEARCH 39
1. A Study on the Dimensions of Knowledge 39
2. A Vertical Analysis of the KMLCM 40
3. The MTAC Knowledge Product 40
4. Vulnerabilities in the Force Protection Knowledge Flow Life Cycle 41
5. Considerations for Testing of MTAC and AT/FP Procedures 41
C. PARTING THOUGHTS 42
LIST OF REFERENCES 43
INITIAL DISTRIBUTION LIST 45

LIST OF FIGURES

Figure 1. Knowledge Growth Over Time 15
Figure 2. The SECI Process 18
Figure 3. Knowledge Management Life Cycle Class Model 21
Figure 4. Inclusion of Context with the Application of New Knowledge 23
Figure 5. Schacher's AT/FP Plan Development Flow Chart 28
Figure 6. IDSEA Knowledge Management System Flow Chart 30
Figure 7. Use of Open and Closed Sources in an Information System 31

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF TABLES

Table 1. Knowledge Management Life Cycle Models..... 17

THIS PAGE INTENTIONALLY LEFT BLANK

ACKNOWLEDGMENTS

I would like to express my sincere appreciation to those individuals who provided their support throughout this endeavor.

To my family for their support throughout this effort, and especially Clay Kistler, thank you. I am grateful for the time you have given to field my questions and provide your keen insight into thesis writing.

To the Reverend William Martin for his prayers, thoughts, editing, and encouragement, thank you for taking the time out of your busy schedule to help me with my work.

To Dr. Erik Jansen and Dr. Shelley Gallup, thank you for the guidance and support throughout my research. It has been an enlightening and enriching experience working with you.

Lastly, thank you Elizabeth for the love and support through this all. The patience you showed and the reassuring words were comforting during these frantic months. I could not have done this without her.

THIS PAGE INTENTIONALLY LEFT BLANK

I. INTRODUCTION

A. BACKGROUND

Historically, naval vessels have sought refuge in ports and harbors when conditions or conflicts at sea were too demanding. The mindset of many naval commanders is that harbors and ports offer a greater sense of force protection and security. This strategic mindset has often led to terrific naval disasters throughout history. The sneak attack on Pearl Harbor nearly obliterated the US Navy Pacific Fleet at the beginning of World War II. US warships were confined to an environment that offered little naval advantage and so were "sitting ducks." The masterminds of the bombing of the USS COLE in Yemen counted on this myth when they orchestrated the successful attack on that US destroyer when it came to rest in a harbor. Ship commanders are well aware that many threats are associated with pulling into port or mooring outside of any country. The mere immobility of the ships and their inability to use the full range of fire control and weapons systems put them on the defensive. When times of crisis arise regionally or globally, US Navy ships generally leave ports and mooring stations immediately, for it is on the high seas that the United States has dominance and greater situational awareness. Radar, sonar, and other sensing equipment networked together allow US commanders the ability to 'see' the enemy. The US naval force is unmatched in, on, and above the seas, but that is not where US vulnerability is most prominent. Port visits are needed to serve US foreign diplomacy, maintain or strengthen relations with other countries, strengthen military ties to allied nations, gain supplies, perform maintenance, and boost crew morale. The US Navy will continue to visit foreign ports and will have to adapt to the regional threats associated with port visits. The US government must develop a solid force protection network that provides the ship's decision makers with the ability to make sound decisions based on an accurate threat assessment of a particular region.

When US Naval forces begin preparations for a port visit, the visiting command's Force Protection Officer (FPO) receives the latest threat assessment from Naval Criminal Investigative Services' (NCIS) agents and other intelligence agencies stationed in the

specified region. The FPO is charged with developing the force protection plan for the command while visiting the port. Using the information provided, the assessment he or she makes helps determine the course of action (COA) followed during the visit. Therefore, the knowledge relayed to the FPO must be as complete as possible. NCIS has recognized the need to better represent the threat level of any region that a naval force enters. As the Internet becomes more widely used onboard ships, the ability to readily update information, chat about local conditions with NCIS agents, email other FPO on sister ships, and exchange information and knowledge is greatly enhanced. This network can provide additional information and guidance to FPO so that proper precautions and training scenarios are taken before the ship arrives in the harbor. Instead of using a hard copy printout of an intelligence report, the FPO has the ability to network with agents and counterparts alike to ensure that their questions are answered. This networked organizational structure allows it greater flexibility in giving meaningful recommendations and in issuing a more informed COA. Although the current system keeps our commanders updated with intelligence and information, this 'information system' must transition into a 'knowledge flow system' in order to best serve the command's force protection efforts.

The "fog of war" has confused military commanders throughout history. Even in an age where sensing capabilities and processing power are widely available, this "fog" has not completely lifted. It is a worthwhile and valiant effort to use technological capabilities in an effort to help "lift this fog of war", but our national military leadership should not count on this alone. History is replete with examples of how militaries have adopted new technology and maintained old concepts of operations with the expectation that the technology alone would solve a problem. In the past this combination of the new with the old did not always yield adequate solutions. For example, the invention of the telegraph allowed for instantaneous communication over great distances in the mid 1800s. Yet this great communication advancement did not reach its full potential as a command and control (C2) structure until the end of the Civil War. The Civil War dragged on partially due to the Union's inability to effectively use the C2 capabilities of the telegraph and railroad. However, President Lincoln realized the potential of this advancement, but needed to convince his general staff to make the organizational shift to

incorporate its C2 capabilities.[1] Organizational modifications to existing structures along with transformational changes in some infrastructures and doctrines are always needed in order to manage properly the increased flow of information. US forces are forever in need of a reliable decision support knowledge based system that gives its commanders the upper hand in the information war surrounding indigenous port regions. The intelligence organizations charged with constructing the knowledge surrounding threat assessments and force protection must be organized in such a manner to take full advantage of technological capabilities of our time while continuing to provide the best support to our decision makers afloat.

B. ORGANIZATION OF THE PAPER

This thesis is intended to analyze the knowledge construction and flow systems surrounding force protection. The problems associated with force protection are problems of knowledge creation, engineering, and management. Therefore the ongoing dialogue and debate concerning these ideas are illustrated in problems surrounding Anti-Terrorism and Force Protection. Those entrusted with planning and organizing these systems should be familiar with current knowledge flow theories and should constantly appraise present systems to ensure that the Multi-Threat Alert Center (MTAC) is a useful means of force protection. Although different groups could draw useful information from this work, it is hoped that this thesis will serve as a catalyst for future in depth explorations associated with the AT/FP knowledge flow system.

Chapter II analyzes the current AT/FP knowledge system. It highlights the roles of those entities that are stakeholders in this knowledge flow system. It gives an introduction to the MTAC and the function that it will provide in the nation's AT/FP plans. The different entities discussed have a unique relationship with each other. Each contributes to the successful construction of a sufficient AT/FP plan. The final section of this chapter speculates on the problems that could arise given a poorly implemented system.

[1] By coupling the railroad and the telegraph, troops could be commanded to attack the South in many different areas at the same time. Technology on its own does not add much benefit to anything without manner in how it is used. See Lincoln and the Telegraph for a thorough documentary on the rise of the telegraph into military operations.

In Chapter III, current knowledge flow theories are reviewed in order to lay the theoretical framework for the analysis section of the paper. It highlights works from knowledge experts such as Dr. Nonaka and Dr. Nissen and examines important knowledge flow principles. Drs. Zahra and George's concept of a knowledge system's absorptive capacity is also introduced. The different areas discussed in this chapter provide the analytical framework that is used in Chapter 4.

Chapter IV reviews a proposal of a AT/FP knowledge flow system. This system is then analyzed under different knowledge flow theories. It examines each of the knowledge theories, applying them to the AT/FP. The final section of this chapter discusses the proposed system's absorptive capacity and its importance for organization.

The last chapter reviews the analysis of the fourth chapter and includes recommendations for the force protection planners. This section is offered to those who work with the MTAC to spur future research in the delineated areas.

II. ANTI-TERRORISM/ FORCE PROTECTION KNOWLEDGE SYSTEM

A. STAKEHOLDERS AND ORGANIZATIONS

Different groups and organizations have vested interests in the AT/FP problem. These different governmental beneficial gains are summarized briefly below. They interact with each other to create a socio-technological system that helps to equip unit decision makers with the most current knowledge and threat assessment possible. It is important to note the make-up of these different entities and their missions since their inputs into the overall force protection system are critical to knowledge construction and management. Each contributes to the creation, modification, and exchange of knowledge that ultimately gives a unit's commander the proper threat assessment of a given port region.

1. Multi-Threat Alert Center

NCIS is working towards the establishment of the Multi-Threat Alert Center (MTAC). This center, to be located in Washington D.C., will take data and information from social, political, environmental, physical, and military sources to formulate threat assessments for particular regions. Groups such as NCIS agents, local law enforcement officials, other US intelligence agencies, and the media will gather such data and information. The fusion of this information into a central location will give regional subject matter experts within the MTAC the ability to analyze and formulate more specific threat assessments of a region. Using statistical data and modeling certain patterns in a society, the MTAC could generate different reports to better capture the knowledge of a particular environment. This presentation of knowledge is intended to give those decision makers afloat better threat assessments with which to make effective force protection COA. These reports will focus on disseminating the explicit knowledge gained about a particular region to those who need it the most. The makeup of the actual internal organization will not be discussed in this study. The MTAC's organization and makeup currently is undergoing a diagnostic testing phase.

The actual product generated from the MTAC is still being debated. One idea being suggested involves fusing this information and knowledge into a network based product. The Naval Postgraduate School (NPS) is currently working on new projects that could yield such products. For example, an XML networked-based product with a three-dimensional graphical interface would allow the FPO the ability to "move" through the virtual environment. He or she will be able to view the ship's position from different angles, atop buildings, from the air, and below the surface. Areas of concern, such as political party headquarters, religious buildings and sites, and areas of recent protests could be highlighted and/or tagged with certain relevant information. FPO can access the site and gather up to the minute reports, graphs, pictures, models, threat assessments and news updates. Although these ideas remain, NPS has already viewed some products that capture this 3-D virtual physical representation.[2] The possibility of expanding this particular concept is discussed in the "Future Research" portion of the last chapter.

2. NCIS Agents

In collaboration with local law enforcement, governmental agencies, news media, and other intelligence assets, NCIS agents will compile and store the information they gain about a particular part of the port region. Because of their geographic location, they will be able to work with the local US embassy and State Department officials, other US intelligence groups, as well as different open-source connections. Human intelligence (HUMINT) is a reliable and trustworthy source of information, and these agents should be viewed as a reliable source of tacit knowledge. They are not tasked with processing and analyzing the data and information as they gather it, but they are definitely an integral part of the knowledge acquisition process. Their inputs about the credibility of certain sources and other measures of confidence they can convey are necessary for properly equipping the MTAC analysts with reliable information. Over secure lines of communication using encryption and other data assurance measures, this information will be transmitted to the regional experts and analysts at the MTAC. The analysts will then

[2] James Harney, Web-Based 3D Reconstruction of Scenarios for Limited Objective Experiments, to be published in Proceedings of the 2002 Summer Computer Simulation Conference, Society for Computer Simulation, 2002.

use first-hand accounts of events, reporting, and recommendations to construct the knowledge product for that region.

The regionally based NCIS agents are also an integral part of the evaluation of the port visit as well. Because they geographically remain in a region after a port visit is completed, they can assist the FPO and MTAC analysts in formulating after-action reports. They should primarily be tasked with preparing the environmental conditions form that helps define the different dynamics within the region. These agents are integral to the commencement of the knowledge creation and evaluation process, because they are in direct contact with the everyday dynamics within the region. This is a high value asset and the utilization of the HUMINT capabilities associated with them should not be unexploited.

3. Force Protection Officers

Each command has someone or some entity charged with the protection of that command during a port visit, typically the FPO. Ultimately the Commander of the visiting staff or crew is responsible for the welfare and safety of all those under his or her command. Threat assessments can come from many different avenues such as the MTAC, the State Department, NCIS, immediate superiors, and the public media. An FPO's job begins with gathering intelligence and threat assessments from these sources and recommending to the Commander a COA most appropriate to the perceived threat. The more knowledge that is imparted to the FPO beforehand the better informed and educated the sailors and marines are before the visit.[3] He or she can then develop training scenarios and evolutions that will increase the crew's awareness and effectiveness against these outlined threats. The proposed COA to certain threats are honed for perfection and the overall situational awareness of the vessel is improved.

During the visitation, crewmembers and watch-standers constantly survey the port environment, observing and reporting all unique events to the FPO and the command's leadership. Modifications to existing COA are issued and documentation of threats

[3] This does not mean that the more information a FPO has, the more informed he or she becomes. With all the data and information available about a certain port environment, it would not take the FPO long to suffer information overload. The processing of such information must be done outside of the ship and fused into knowledge. Thus only in a knowledge product would the "more equals better" function be applicable.

encountered is made. FPO and officers aboard the visiting vessel can be in contact with the locally based NCIS agents to secure direct input into the port dynamics. As the duration of the port visit increases the officers and crew of the visiting command become more acclimated to the environment and have a greater knowledge of the port's state of affairs.

The agents charged with collecting data and information must be well networked in the region's society. NCIS agents rely on personal ties, friendships, and business dealings to gather data and information. This also carries a weight of confidence as well. Trust of those from whom our agents gather information is ultimately dependent upon the individual agents' assessments. Becoming socially networked in a given society takes time, but the information capital that can be gained is critical for producing an accurate threat assessment. Other social networks that will form in this information system emerge between the agents themselves, the analysts at the MTAC, and the FPO and their ISIC's at sea. Personal relations that form within defense chat rooms or from the exchange of emails or phone calls help to establish trust amongst the AT/FP team. Although the actors in this system are doctrinally on the same team given the mission of AT/FP, the personal ties that form can add to the development of a more complete knowledge of the battlespace.

4. Immediate Superior in Command

Even though the MTAC ought to be incorporated into the knowledge flow system of force protection, they do not and should not have the authority to direct tactical actions. The knowledge product that the center generates will be viewed both by the visiting command and that command's immediate superior in command (ISIC) as a recommendation or assessment of conditions. One of the roles of any ISIC is to be kept informed of the units under its command. Using command by negation or decentralized C2, the visiting unit is charged with developing the COA for the port visit. The ISIC, having access to the same knowledge product from the MTAC, will either agree or modify that plan in accordance with its guidelines. The authority and responsibility of the operational and tactical functions the ISIC's units should not be modified given the inclusion of the MTAC into the knowledge flow system. The ISIC remains active throughout the port visit assisting in the C2 of the visiting units. Although ISIC will vary

throughout the Navy, their role in the operational chain of command is not affected by the inclusion of the MTAC in to AT/FP planning.

B. PROBLEMS ASSOCIATED WITH THE MTAC

Too often leaders and managers of today strive to fix many problems with a predominately technological solution. The planners and visionaries of the systems surrounding AT/FP and the MTAC should be aware of the consequences of such ineffective trends. The inclusions of information technology (IT) systems such as databases, word processors, electronic filing, and other shareware suites might aid in the improvement of certain information systems, but should not be relied upon as a complete knowledge–work progress or as an instance of a knowledge management system.[4] The terms "data warehouse" and "database" rightly suggest functions of utility and data processing but do not of themselves generate certain knowledge. It is the interaction of these data and information systems with context, analysis, and cognition that yields the construction of certain knowledge.

Once data and information are collected, it must safely get to the MTAC in order to be deciphered and assimilated. Data and information will flow from different regions to this centralized location before being disseminated to the FPO. How given information flows to the MTAC and from the MTAC to the ship and what form it takes can bring about some vulnerabilities to the transfer and dissemination processes. "Critical national infrastructures for power, telecommunications, and transportation, as well as crucial commercial databases and information systems for finance and health, remain vulnerable to computer hackers and cyberterrorists."[5] There is still a tendency, when trying to set up a "network organization" or "network information system" to make it hierarchical. Because the proposed organization of the information flow with regards to the MTAC centralizes all information, it is vulnerable to certain attacks. Therefore the flow of information through a central node carries with it the certain vulnerabilities of a logical star network. This idea stems from the technical designs of a common client-server network. A break or disruption in the communications between regional

[4] T.H.Davenport, and L. Prusak, Working Knowledge: How Organizations Manage what they Know (Boston, MA: Harvard Business School Press, 1998).

[5] Arquilla, John, David Ronfeldt, *Networks and Netwars: The Future of Terror, Crime and Militancy*, Santa Monica, Calif.: RAND, P 314, 2001.

intelligence agencies and the MTAC will isolate the FPO without his or her needed intelligence and knowledge product. Peer to Peer (P2P) networks allow for a "multi-connected star" network structure similar to an all-channel network. In designing the MTAC's information system, the concerns of single points of failure need to be evaluated to ensure that path dependency does not occur. This will ensure that the FPO is not solely reliant on the MTAC for the final vital knowledge product. The technological security of this information system is only as good as the route that the information takes to get to and from the MTAC and as secure as the encryption used to protect that information. The security of the server in which the final XML product resides determines whether the ship will actually be able to use the intended product or not. Communication should readily pass between the NCIS agents on shore and the FPO afloat. P2P networking should be incorporated into this process. This will provide an added measure of security to insure that the information flows freely from the MTAC to the decision makers. A highly robust and dynamic network will ensure that information and knowledge is imparted to those entities that need it.

C. SUMMARY

The common goals of force protection and US national policy are cohesive principles that favor multi-hub or all-channel networks. Communication between the ship's decision makers and the regional agents can be carried out in chat rooms, email, and message boards. The initiative of FPO and other officers and staffs instinctively joins people in networks in order to better serve the common mission of force protection. The belief in the nation's safety doctrinally joins servicemen together in this fight for battlespace knowledge supremacy. FPO on different ships can share ideas, and agents can contact their counterparts in other regions for new ideas, COA, or tactics. This collective fleet mindset is the natural instigator of social networks. The nation's forces do not need to resort to a "leaderless" network to carry out its missions. Already FPO and commanders rely too heavily upon the intelligence gathered from land-based intelligence agencies. Distributed groups, such as al 'Qaida's loosely connected network, tend to favor the extremist groups who aspire to inspire dissidents from around the world to take part in acts favorable to their cause.

The use of networking principles can move US naval forces closer to constructing knowledge of the port environment and the threats associated with it. The information systems that control the flow across the actors associated with AT/FP need to be tailored to minimize the threat of disruption. The ability to directly access the intelligence sources in the port region will greatly help the FPO and commanders to formulate force protection decisions. Ultimately, the knowledge flow system should generate proper training, education, and tactical action prior to entrance into a region. The success of future port visits rests on the ability to keep ships safe when they are most exposed to danger. Contrary to what many believe today, ships have far more challenges in port than on the high seas. The proliferation of short and medium range missiles, hypersonic missiles, and low-tech attacks such as swimmers and disgruntled citizens, have made the port environment the ultimate battleground. Ship commanders cannot afford to go into this highly complex environment without being made properly aware of the threats associated with it. Thus, the MTAC will fulfill a vital role in the protection of US Naval assets.

THIS PAGE INTENTIONALLY LEFT BLANK

III. KNOWLEDGE MANAGEMENT FRAMEWORKS

A. THE KNOWLEDGE MANAGEMENT LIFE CYCLE MODELS

There is a subtle but distinct difference between information and knowledge. Information superiority has its place in operations used to defend our country. Electronic warfare, information warfare, and jamming are some options a refined military has at its disposal. These tools target the "bits" and flow of communication and are more technical and quantitative in nature. The task for AT/FP must be more focused on knowledge construction and knowledge management. Formulating a comprehensive understanding or knowledge of a region assists decision makers with making accurate threat assessments. This problem is complex because it has many variables and resides in a dynamic environment. The Knowledge Management Life Cycle Models help codify these different ideas and put a framework around the AT/FP problem.

1. Knowledge Defined

Knowledge by itself is not to be viewed as something that is static and unchanging (i.e., absolute truth). For the use in this study, knowledge is defined as "a dynamic human process of justifying personal or organizational belief toward the 'truth.'[6] This definition by Nonaka suggests a more subjective and dynamic view of knowledge which is an ongoing interaction of brainpower with technical information systems. Knowledge cannot be separated from human cognition, and so cannot exist solely in a technical system. However, it can utilize in a particular situation and under specific circumstances or conditions. This is possible since certain forms of knowledge are relative and environmentally specific. Knowledge can also be viewed as incorporating a dynamic process of necessary modification as it encounters new information and cognition. Therefore, knowledge is relatively incomplete and contextually potential. Knowledge as a transitory process must rely upon its foundational surety as it moves towards what it does not yet grasp.

---

6 I.Nonaka, and T. Nishiguchi. Knowledge Emergence. New York, New York. Oxford University Press INC. 2001.

Knowledge can be divided into two distinct types: explicit and tacit knowledge. Explicit knowledge is that understanding that is gained from academic research and is defined by formulas, definitions, or other unambiguous expressions. Because of its well-documented structure, it is more easily expressed and transmitted because of its somewhat 'static' or defined nature. Therefore, explicit knowledge should be accompanied by environmental and conditional contexts in order to be considered complete. Tacit knowledge is harder to acquire and is specifically dependent upon human cognition and reason. It emerges from an entity's engagement with practical experience. It yields practical operational experience or specific "know how."[7] This type of knowledge resides in a person or organization's practices or processes. It is more difficult to transfer or explain due to the manner in which it is defined. Tacit knowledge is the operationalization of explicit knowledge whether intended or not. It must be noted that knowledge does not have to be strictly labeled as either tacit or explicit. Each kind of knowledge can be defined as 'more tacit' or 'more explicit' because it may have some proportion of both. This point is discussed in the "Knowledge Creation" section of this chapter.

The information and knowledge of a port environment that a command gathers depends upon the duration of the port visit. By the end of the port visit, the command, especially the FPO, commanders, and intelligence agents, has a greater understanding of the region than they had prior to the visit. Before a ship or a command enters a region, it gains mostly explicit knowledge from the MTAC and other agencies. This explicit knowledge is used to educate the officers and familiarize them with the region. Yet first-hand accounts and events (tacit knowledge) also directly influence the tactical decisions that fleet commanders must make. Because of the many different aspects of a port environment and its dynamic nature, this knowledge must be used concurrently with explicit knowledge to have a more complete understanding of the threats associated with that region. As a result of positive and negative encounters made during the visit, all force protection personnel have a better understanding of the port environment and the subsequent courses of action. These processes and COA that were implemented were

[7] I. Nonaka. "The Knowledge-Creating Company." Harvard Business Review on Knowledge Management. Harvard Business School Press. 1998.

either validated or were proved inadequate. As the command compiles the "lessons learned" from the port visit, it attempts to make explicit what it learned. The command's tacit knowledge must somehow be archived or shared with future visiting commands so that the flow of knowledge does not rely solely on an explicit knowledge base. The processes of gathering tacit knowledge tend to create an ever broadening explicit knowledge base, because explicit knowledge can be stored and be more easily transmitted. Thus the process of converting tacit knowledge into explicit knowledge is a key function to the creation of knowledge superiority.

An example may be seen in the model taken from a journal article on the "U.S. Navy Battle Group Theater Transition Process (BGTTP)[8]." Figure 1 shows the potential gain that could occur given an ideal knowledge flow system. The knowledge management product from the MTAC must be combined with a knowledge flow generated by the visit in order to maximize the gains of this process. The mission and goals of the MTAC and force protection knowledge flow system should aim at minimizing the loss in knowledge occurring at the transition point of the graph below.

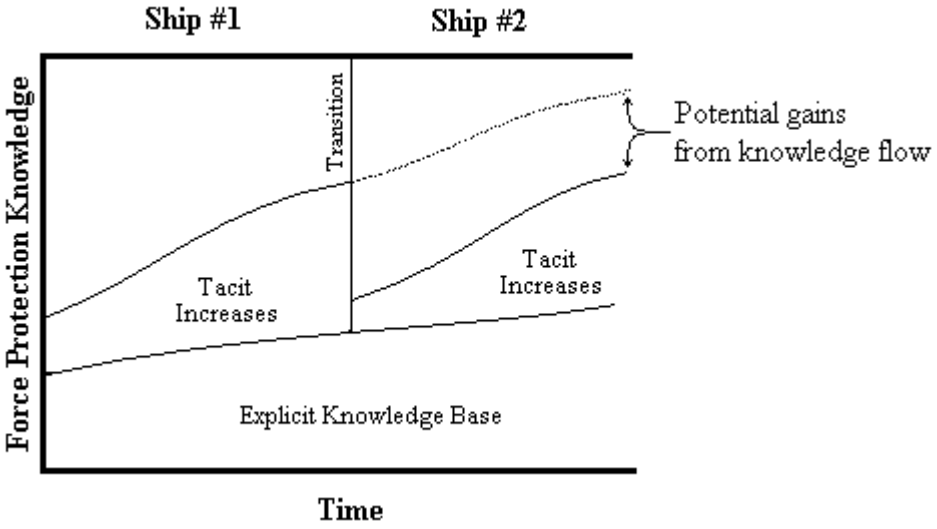


Figure 1. Knowledge Growth Over Time

As the graph reveals, there is a gradual increase in explicit knowledge as time increases. Context based reports are generated on board the ship and by intelligence

[8] E. Oxendine, and M. E. Nissen, "Knowledge Process and System Design for the Carrier Battle Group," Knowledge and Innovation: Journal of the KMCI, Vol 1, No 3. April 15, 2001. See also M.E. Nissen, Facilitating Naval Knowledge Flow, Naval Postgraduate School, July, 2001.

agents ashore. These 'lessons learned' contributions broaden the ever-growing explicit knowledge base. This graph, however, does not illustrate the fact that certain knowledge is restricted by the environment or context in which it is used. Because the environment can shift or evolve, the explicit knowledge that is sought after in force protection may actually diminish. Certain established norms of means of organized practices might change fundamentally, and therefore could challenge previous knowledge of an environmental context. Sudden changes in the environment, like the terrorist events of September 11th, may even cause the knowledge base to be questioned[9]. The explicit knowledge base function is not linear nor is it necessarily constantly enhanced. The environmental scope of explicit knowledge and the absorptive capacity of the organizations involved in force protection determine the level of knowledge gained. Therefore, the explicit knowledge base may be seriously threatened. It must be noted that declines in explicit knowledge and the possible need to adjust it is not necessarily undesired. Such can generate a change in the US's AT/FP mindset or environmental conditions of a region.

2. Knowledge Management

Knowledge management can be viewed as a collection of processes that work either independently or together to support the construction or flow of knowledge by partitioning the knowledge flow system into specific processes. Definitions and identities can be placed on these contributing processes. The functionality of these processes can be overlapping, separate, concurrent, and even recursive. Many researchers in the knowledge management field have attempted to capture this in a Knowledge Management Life Cycle Model (KMLCM). Although the names associated with the processes or phases are not the same, the flow through the model follows a very similar path to the final end product of knowledge. Table 1 lists the major life cycle models with their associated names to the different phases.

[9] This is to say that a paradigm shift can occur.

Table 1. Knowledge Management Life Cycle Models[10]

Model	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
Nissen	Capture	Organize	Formalize	Distribute	Apply	
Despres and Chauvel	Create	Map/bundle	Store	Share/transfer	Reuse	Evolve
Gartner Group	Create	Organize	Capture	Access	Use	
Davenport & Prusak	Generate		Codify	Transfer		
Amalgamated	Create	Organize	Formalize	Distribute	Apply	Evolve

Although this paper does not address the great complexities associated with each of the above individual phases, it must be stated that each of them has scalable granularity associated dependent on the dimension it is to be used. For example, in the third phase, where the formalization, storing, codifying and so forth occur, this process is different according to the entity using it. It will be different, sometimes drastically, depending whether a sole person, team, or organization is engaged in the process. A life cycle is a continuously running process of events that leads to an end product of knowledge. It also should be noted that references to the life cycle model in this paper use the amalgamated terms. Potential gains for research into these phases and the implications it could have are discussed in the 'Future Research' portion of the conclusion chapter.

3. Knowledge Creation

Knowledge is molded into different forms by those who use it. At certain times, a person or entity has a combination of tacit with explicit knowledge. Because knowledge is a dynamic flow of different processes, different means are associated with moving knowledge between the tacit and explicit forms. A knowledge set could have explicit aspects attributed to it while remaining mostly tacit. In thinking about knowledge, it is helpful to realize the tacit and explicit nature of certain sets of knowledge. This will help those charged with knowledge management to establish efficient knowledge flow systems. However, the most complete knowledge of a certain subject will incorporate the many different processes like socialization, externalization, combination, and internalization (SECI Process). Figure 2 illustrates by what means knowledge is moved in order to transform between and within the different forms.

[10] M.E. Nissen, M. Kamel, K. Sengupta; "Integrated Analysis and Design of Knowledge Systems and Processes," Information Resources Management Journal, Idea Group Publishing, Jan-Mar, 2000, Page 30.

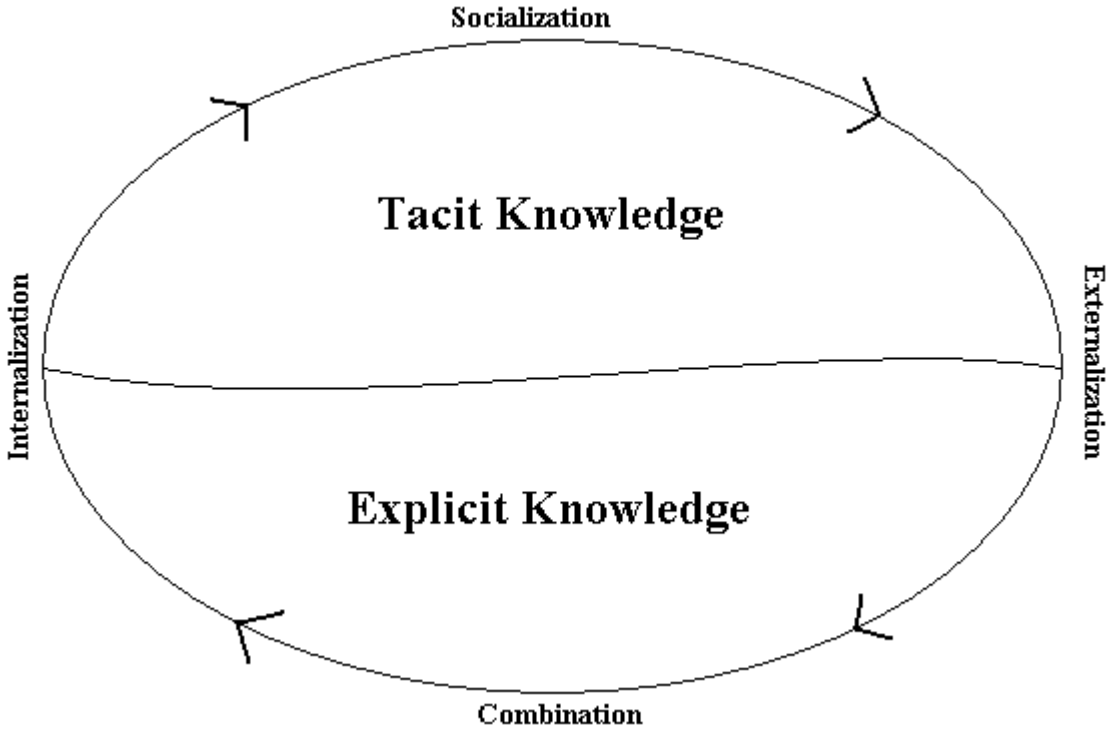


Figure 2. The SECI Process

It takes interaction among different groups of people in multiple situations to perpetuate the movement of knowledge between the two categories.[11] It is important to note that creation or construction of knowledge must mingle between these two forms in order to be more useful. Either pure explicit or pure tacit knowledge alone will not yield a complete understanding. The formal research and knowledge management associated with the explicit type must be challenged and tested by the practical factors that exist in the tacit type. This SECI process leads to one dimension of knowledge only. In it fuller knowledge can be secured from a host of interactions and incremental co-inherence. Knowledge is not a single dimensional object; knowledge can be complex, codified, and applied in multidimensional ways. The study of knowledge creation and management as the theoretical basis for analyzing the AT/FP organization demands that knowledge be placed within specific frameworks. Further studies using the different dimensions of knowledge are discussed in the last chapter of this paper.

---

[11] See Nonaka's example of the Osaka-based Matsushita Electric Company's automation of the bread-making machine in "The Knowledge-Creating Company" article.

I. Nonaka. "The Knowledge-Creating Company." Harvard Business Review on Knowledge Management. Harvard Business School Press. 1998.

B. USE OF KNOWLEDGE BASED SYSTEMS

The ability to disseminate a perceived 'true' threat is crucial to the government's ability to protect visiting commands. Knowledge based systems (KBS) will become the expert tools upon which the fleet will rely on to transmit not only force protection knowledge, but also battlespace knowledge. KBS are not to be confused with data or information based systems. As stated above, because of its dynamic and cognitive nature, knowledge is conceptually separate from data and information. The use of KBS only can take form after a sufficient system capable of transferring tacit knowledge into explicit knowledge is in place. Force protection organization cannot be solved completely by technical means, but also requires a human element. The ultimate goal of KBS in force protection is to store explicit knowledge in a manner that allows it to be applied directly.

KBS thus involves a new way of thinking about information based systems and database management systems. These new systems require that organizations, governments, and militaries approach knowledge management innovatively. The United States has a plan for its armed forces by the year 2020.[12] To implement this vision, the US Navy relies heavily on the concept of Network Centric Warfare (NCW) as a force multiplier. However, that US Naval forces are able to access the Internet does not mean that they are "networked"[13]. Connection capability does not ensure that networking will be used effectively. It is the functionality of the fleet as a networked force and the end goal of mission accomplishment using these means that determines whether a force is network centric or not. The KBS used in force protection must be environmentally and contextually indexed in order to produce sound explicit references. It should be able to archive, organize, and retrieve relevant knowledge providing MTAC workers with the

[12] United States Joint Chiefs of Staff. Joint Vision 2020. June 2000.

[13] Actually, the US Navy has led the way operationally in becoming a networked force. The extensive use of radio and radar since the Second World War has given naval commanders the ability to construct a larger picture of the battlespace. Over the horizon aircraft and the introduction of LINK and Aegis equipment has provided the sensing capabilities to pictorially display the battlespace.

accessibility to such pertinent resources. Ultimately, these KBS will be the socio-technical 'brain' of the AT/FP organization, storing the trials, lessons, and contexts of passed events. The proper planning and engineering of the human element involved in these systems is critical to the robustness of the MTAC.

C. PROCESS ANALYSIS AND REPRESENTATION

The KMLCM provides a framework in which to study an application. The model and concepts surrounding knowledge construction and management can be analyzed according to general categories or particular situations. A broad epistemological approach discerns different ideas, models, and discussions that emerge from a situation. A more in-depth study discloses the particular processes, practices, inputs, and local variables that contribute to knowledge construction or flow. Each of these scopes provides useful vantage points from which to gain insight. Contextual or environment analysis focuses on the relative nature of knowledge. The importance of the environment and conditions with which knowledge exists helps further define and codify it. The following general analytical frameworks provide a structure from which different understandings of knowledge creation and flow can be generated.

1. Horizontal Scope Analysis

Describing knowledge as explicit or tacit contributes to the overall increase in the knowledge base. The four processes included in the SECI model reveal knowledge in a dynamic self-improving state. The interaction within a knowledge type is just as important as the conversion from one type of knowledge to the other. The examination of the tacit to explicit, explicit to explicit, explicit to tacit, and tacit to tacit knowledge flows of a system has the potential to yield a new understanding about system entities, processes, and practices. An appraisal of a system under this framework yields which players or processes help complete each of the four functions delineated by Nonaka. The MTAC and force protection processes or practices that do not aid in the execution or completion of one of these four processes must be analyzed in detail to ensure that they are contributing to the knowledge flow system.

2. Vertical Scope Analysis

Nissen organizes the KMLCM processes into either a supportive or performative role (see Figure 3). The phases that are listed as Class I processes are supportive in nature, and are most commonly used in conjunction with IT support. The functions they perform in the knowledge management infrastructure generally assist the people in the organization. The remaining Class II processes are performative in nature because of their dynamic interaction with people. These are the systems that perform knowledge management. In conducting a vertical analysis of a knowledge management system, the focuses would be on the two major classes of processes and an in-depth look at the systems contributing to each of the six functions. Such an analysis would delineate a whole subgroup of functions with particular inputs, outputs, resources, and constraints that are unique to the case study. The knowledge creation and management process is directly affected by the quality of the many different information systems supporting it. Each information system and IT program behind each knowledge management process should be specified in such system analysis. Such an analysis also would indicate the level of confidence associated with a particular process.

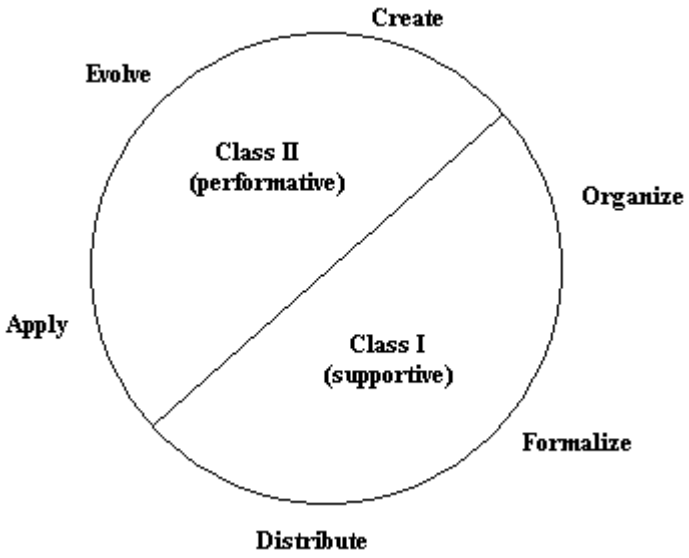


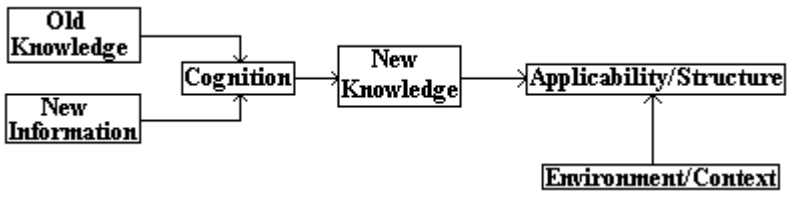
Figure 3. Knowledge Management Life Cycle Class Model[14]

[14] M.E. Nissen, Facilitating Naval Knowledge Flow, Naval Postgraduate School, July, 2001. Page 6.

3. Contextual Analysis

Human knowledge is contextual. The analysis of knowledge flow systems, demands that system planners and organizers study the context that qualifies and creates fuller knowledge. Knowledge that is generated without reference to context is vague and incomplete. It is difficult to communicate relevant knowledge to others because it is vulnerable to distortion due to the different contexts with which people associate it. Users are unable to interpret situations and apply knowledge without first examining the relative circumstances and environmental conditions of the subject. Nonaka concludes, "Thus what makes sense in one context can change or even lose its meaning when communicated to people in a different context.[15]" Because knowledge is a dynamic process and since it is used in a flow system, skewed-knowledge continues to be distorted as it moves through an organization. If the system is capable of interpreting knowledge within a contextual framework, then the import will have been externalized and thus made explicit. Contextual analysis is essential to the process of transforming tacit knowledge into explicit knowledge. Every effort should be made to ensure that contextual distortion does not occur before it is made explicit.

Information without cognition will not contribute to an entity's knowledge base. The KMLCM provides a spectrum to categorize the major functions of knowledge flow. Although knowledge can be used at any phase in the KMLCM, understanding in any phase requires context. The creation of knowledge requires the combination of new information and old knowledge through cognition. This human grasp of old and still relevant knowledge and its relation to new information yields an updated knowledge base. Thus, the application of this new knowledge must be used under the same or similar conditions it was formed from in order for it to be constructive. The figure below illustrates the appropriate application of new knowledge with context.



[15] I. Nonaka. "The Knowledge-Creating Company." Harvard Business Review on Knowledge Management. Harvard Business School Press. 1998. Page 39.

Figure 4. Inclusion of Context with the Application of New Knowledge

D. KNOWLEDGE SYSTEMS AND ABSORPTIVE CAPACITY

1. Absorptive Capacity Overview

The knowledge management concept of absorptive capacity (ACAP) is useful in analyzing systems and organizations. This construct examines how well an entity learns or performs in a dynamic environment. The academic investigation of this topic is ongoing and definitions vary. For this paper, ACAP is referred to as, "a dynamic capability pertaining to knowledge creation and utilization that enhances a firm's ability to gain and sustain a competitive advantage."[16] If an organization can utilize its dynamic capabilities and channel them into useful functions and potential gains, it can maximize its utilization of knowledge and enhance performance. Considering ACAP in this manner is different from other definitions in that it is not confined to a set of skills in knowledge management. It is not simply scoped to the ability of an organization to accept technological change nor is it entirely the learning capability of an entity. ACAP involves practices and capabilities that help it become dynamic in nature. Concentrating of the different dimensions that define ACAP constantly improves the organization in bringing in and effectively processing new knowledge.

2. Dimensions of Absorptive Capacity

According to Zahra and George, ACAP combines of different organizational capabilities that collectively give an organization or a system a competitive advantage: acquisition, assimilation, transformation, and exploitation. The end result of these combined capabilities working together will make ACAP a dynamic capability. The following sections highlight the major themes of Zahra's and George's definitions of the different dimensions of ACAP.

a. Acquisition

The ability to acquire new information and knowledge is a common theme in different studies conducted by Nonaka, Nissen, as well as Zahra and George. Any organization interested in the creation and/or collection of knowledge must pay special attention to the processes and practices that support new knowledge and its inclusion into

[16] S. Zahra. and G. George. "Absorptive Capacity: A Review, Reconceptualization, and Extension."

the system. Zahra and George indicate that the intensity, speed, and direction with which acquisition processes act directly influence the ACAP of an organization. Practices that increase the strength and intensity of a systems knowledge acquisition effort can therefore lead to an increase in the ACAP of that system. The speed with which new knowledge is accumulated is sometimes dependent on the prior knowledge base's definition or special properties. Often more time and energy is needed to extract knowledge. Therefore systems tailored for speed that seek to acquire knowledge too quickly might find themselves gathering incomplete and unreliable knowledge conclusions. Special attention must also be paid to the direction in which some processes or practices take. Time and energy directed in skewed or dubious areas can also decrease the ability of the company to acquire relevant and useful information and knowledge in a sufficient amount of time. Therefore, those practices that acquire and include extant knowledge require close scrutiny to ensure their effectiveness.

b. Assimilation

Once an organization has gathered new knowledge, it must interpret it in order to make use of it. This process of assimilation ensures that the knowledge is understood by attaching special context and significance to its different segments. Some time might be needed in order to acquire new knowledge if it is determined that the desired knowledge depends on another new set of knowledge. Therefore the assimilation and acquisition processes may work together in order to generate a more complete understanding of and support for the knowledge within an organization. To outside observers, the relevance and meaning of such acquired knowledge might not be apparent because of its purpose or context. This ability to assimilate the knowledge and attach special contexts to it directly affects the learning and understanding of the organization. Some of these processes may work closely with technology in order to process and organize. Best practices and processes in the assimilation of external knowledge increase ACAP. The organization possesses a system that is sufficient to assimilate and thus make room for new knowledge flows.

Academy of Management Review. 2002, Vol. 27, No. 2, Page 185.

c. Transformation

The transformation process can be viewed as a foundry for an organization's knowledge. A system combines internal knowledge with the newly acquired external assimilated knowledge to interpret it into a new and useful product. Like artificial intelligence programs, knowledge has to be joined with other known knowledge bases in order to prove or disprove the existence of anything. Using this process, an organization or system can then view the knowledge from more than one frame of reference. Knowledge that can be labeled as irrelevant is discarded from the system and knowledge that has potential is saved. By using different schema, a selected set of knowledge can take on different meanings. In Figure 4, new information is combined with old knowledge through cognition. By the knowledge with which the new information is processed, a new understanding could be formed.[17] The ability to do this gives the organization the capacity to broaden its existing knowledge engineering practices by viewing knowledge from different vantage points.

d. Exploitation

Knowledge must be put to use in order to be of any value to the organization. The way in which a system applies or exploits the knowledge is the final vocation in ACAP. If the above process and the practices associated with them are successful, the measure of the system's ACAP then resides with the exploitation or implementation of the knowledge. The effective use of the refined knowledge then provides a test to determine if the system was able to extract the needed understandings from the knowledge. The implementation of such knowledge pertains to all processes contributing to the use of the knowledge and can range over extended periods of time. Also, a byproduct of the utilization of the knowledge may be the creation of new knowledge to be acquired and assimilated. Therefore this dimension of ACAP may spur future acquisition processes.

[17] See the concept of bisociation: A. Koestler. 1966. *The Act of Creation.* London: Hutchinson. 1966. Page 35.

E. SUMMARY

These theoretical frameworks provide a structured view of a knowledge management problem. They specify types of knowledge, labels processes, and highlights the importance of contextual inclusion. Many companies and organizations are investigating ACAP to see how well their own systems match up. Applying this to knowledge creation and management problems provides for a structured extraction of valuable insights. It assists in identifying important processes and practices as well as those that are not directly contributing to the knowledge flow process.

IV. KNOWLEDGE FLOW AND FORCE PROTECTION

A. KNOWLEDGE MANAGEMENT LIFE CYCLE AND FORCE PROTECTION (THE SCHACHER PROPOSAL)

The MTAC's knowledge management product must be combined with a knowledge flow generated by any given port visit in order to minimize the loss in knowledge at the transition point (See Figure 1).

All of the personnel involved in AT/FP play some role in the knowledge management life cycle. Different force protection stakeholders, whether locally present or geographically removed, share phases of the KMLCM concurrently. Ideally, the MTAC ideally uses its resources to provide real time threat assessments that are as accurate as possible. This can be accomplished through local engagement and coordination of friendly sensors that feed data and information into a central processing center. It is the interaction of sensing capabilities with a knowledge flow system that produces accurate estimations of the current environment. All six steps of the KMLCM occur in some form in the knowledge system surrounding the MTAC. The MTAC founders and organizers are charged with overseeing and improving each of the knowledge management phases.

The Institute for Defense Systems Engineering Analysis (IDSEA) is supporting the MTAC planners in their development of a functioning entity. This Monterey-based institute is conducting limited objective experiments (LOE) to gain a 'lessons learned' knowledge base on the many different aspects of force protection and the information and knowledge systems associated with it. It also serves as a foundry of fresh ideas for the general concern with force protection. The LOE's conducted by IDSEA must be complex and detailed enough to ensure that they sufficiently challenge each of the phases associated with the KMLCM. Ultimately the MTAC is a knowledge creation and managing system and thus takes on all of the issues surrounding this type of structure. In essence, it must embrace the method of critical construction in order to become the master of knowledge management. Without a successful system like this in place, the

fleet's decision must protect the force without the proper intelligence and knowledge assets.

Gordon Schacher at the IDSEA is formulating strategy by which knowledge can be constructed and disseminated through the MTAC. He heeded the advice of senior naval leaders who insisted that a ship's functioning should not be stressed or hindered by the addition of this system. Figure 4 illustrates the flow of knowledge from the phase of its construction until ultimate use as a force protection plan. Schacher believes that an essential part of this system is the inclusion of pre-plans. These plans are not meant to exist as particular individual solutions to certain scenarios. Therefore to avoid form-fitting a solution to a problem this system must encourage due-diligence. These plans must rely on a successful past-plan and also incorporate the new considerations and conditions associated with the current environment.

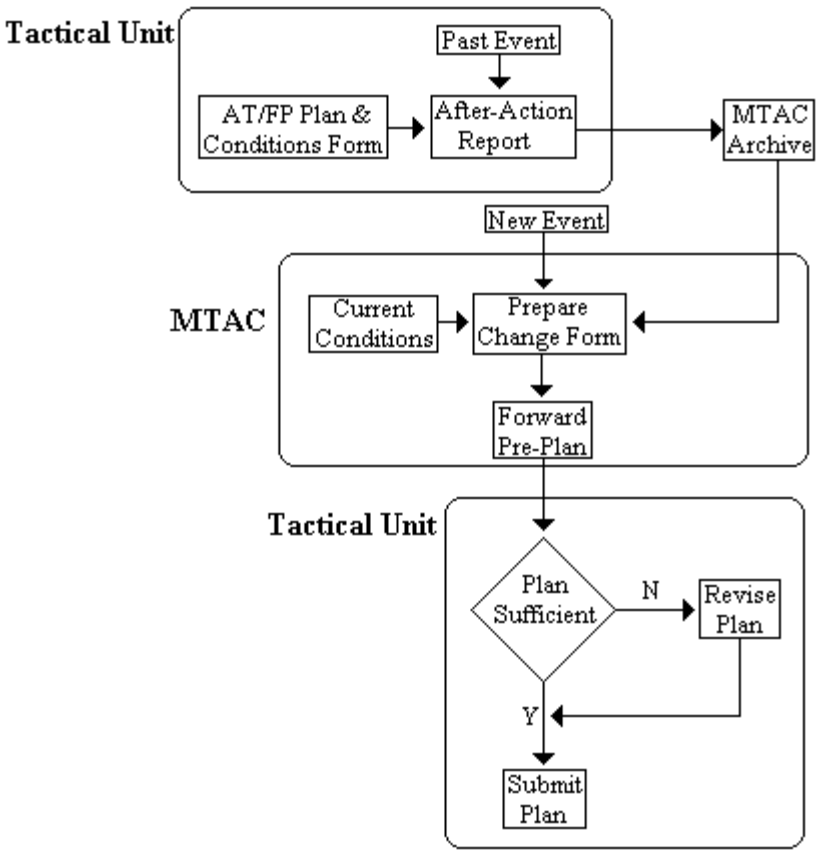


Figure 5. Schacher's AT/FP Plan Development Flow Chart

The use of a "conditions form" during the after-action report allows for contextual inclusion. That way, when it is sent to the MTAC archive, it is not only a detailed report highlighting new knowledge generated, it also includes relevant contextual information because of the environmental considerations associated with it. This proposed system aims to ensure that a contextual framework is appended to the knowledge. When the MTAC has a new event that occurs or is preparing a product for a visiting command, it uses the process in Figure 4 to combine old knowledge with new information. By taking old knowledge reports from the MTAC archive and combining them with new information and current conditions, the MTAC analysts are able to assimilate this knowledge. Schacher's system includes the "conditions" form and other means of incorporating context and environment into the knowledge process, so that explicit knowledge generated is not improperly stored. The tactical unit has a product based on properly constructed explicit knowledge. Because of the intelligence and knowledge that is imparted by the MTAC, the visiting command can better train with near realistic suppositions. This reliable product then can be used as a basis to construct a pre-plan, and ultimately, an adequate COA.

B. USE OF KNOWLEDGE BASED SYSTEMS IN FORCE PROTECTION

The MTAC will be home for the main KBS of the AT/FP system. In Figure 5, this KBS is represented as the MTAC Archive. This mainly technological system must be a well crafted and thoroughly organized system that guarantees reliable storage, file organization, and retrieval. It should have the ability to query by different regions, environmental conditions, force sizes, force types, threat conditions, planned COA, actions taken, mistakes, and to address other considerations stipulated by the MTAC analysts. The KBS should be robust and detailed enough so that the MTAC analysts are given a powerful mining tool with which to work. It is axiomatic that after-action reports, though involving tedious and time consuming processes, should not be underused. This system should be networked based in order to speed the sending and receiving of forms and reports from the different units and agents. This system will provide for standardization of certain specific condition forms and reports and thus aid in the storage and organization of the KBS.

Although the inclusion of such a robust system is necessary, the human component within that system needs to be further defined. A completely automated KBS is not the solution that will give the fleet commanders a better knowledge of the port environment they will be visiting. It is the combination of these queries with human analysis and interpretation that yields useful and applicable knowledge. IDSEA's knowledge management system joins human interaction with automated processes and practices in order to achieve a detailed, focused result. By updating the learning objectives, IDSEA can modify the information structure and refine the search criteria. Both of these changes help redefine the focused results. It is the cognition of the analysts that will ultimately produced the desired results.

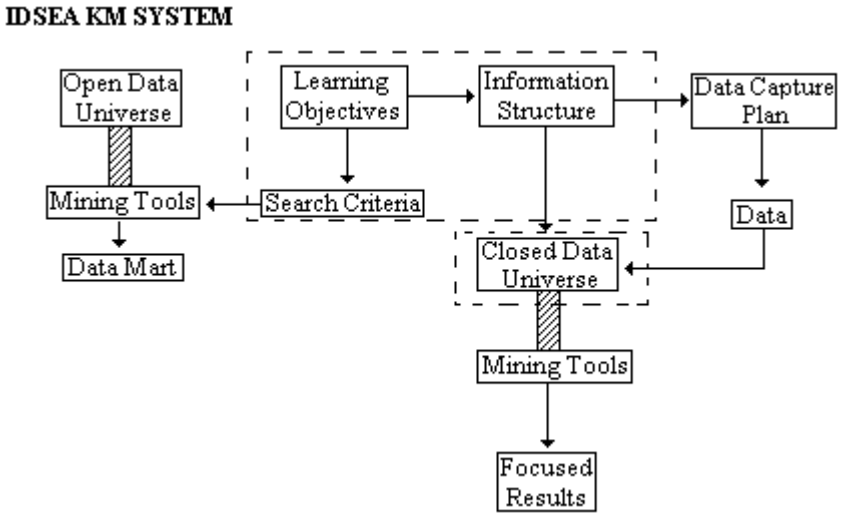


Figure 6. IDSEA Knowledge Management System Flow Chart

Open source gathering of information was used sporadically by most intelligence organizations prior to the events of September 11, 2001. By combining the open and closed sources through a structured extraction, a KBS can contextually apply certain open sources for use with AT/FP. This use of both classified and unclassified materials saves the command's force protection personnel processing time. In the current system a ship's FPO and wardroom are processing most of the open source mining. If this fusion of open and closed resources is assumed by the MTAC, specifically the KBS, this practice will relieve some of the research and processing work of personnel afloat.

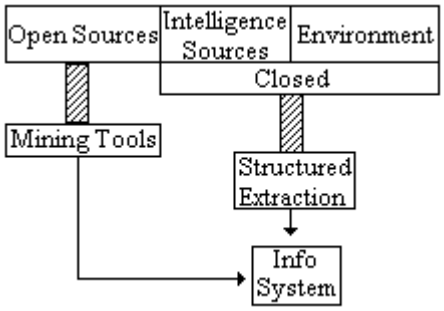


Figure 7. Use of Open and Closed Sources in an Information System

C. SCHACHER PROCESS ANALYSIS AND REPRESENTATION

1. Horizontal Scope Analysis

In order to keep knowledge current and complete, an entity's explicit knowledge base must be challenged constantly by exposure to a number of tacit experiences and by inculcating those parts deemed new and relevant. Therefore, the Schacher process incorporates the four processes illustrated in Figure 2 in order to insure that this system does not asymptotically degenerate into a level of uselessness. The following four sections analyze how the Schacher proposal incorporates the SECI processes. It should be noted that all processes are not solely tacit or explicit but do involve a blending of the two.

a. Tacit to Explicit Knowledge Flow

Figure 1 reveals that a ship pulling out from a port visit is at the height of its tacit understanding of the environment. It is well habituated to the practices and COA required to work and exist in the port environment. An after-action report provides a way to externalize that knowledge into something explicit. After any port visit, this report provides a means for reflection on the effectiveness of the force protection plan implemented and includes recommendations for similar future visits. In the lessons learned portion of the report quality explicit knowledge is potentially generated. The unit making the visit and the local agents assisting with the call each generate these reports. The visiting command provides most of the courses of action and plans to be executed along with their results. These are the processes that will be under scrutiny to determine the effectiveness of their implementation. The local agents assisting the command are crucial to this externalization process because they bear the burden of fulfilling the

conditions portion for the report. This environmental context that must be incorporated to help the MTAC analysts determine cause and effect relationships. This contextual inclusion enhances the credibility of the explicit knowledge base because it becomes environmentally dependent and relevant. These reports are then transmitted to the MTAC Archive where they enter the KBS.

b. Explicit to Explicit Knowledge Flow

One of the main purposes of the MTAC is to ensure that explicit knowledge is combined with other knowledge to ensure a unified understanding of a certain environment. Having a central processing and storage center makes this combination of knowledge easier for the MTAC analysts. The KBS at the MTAC should be the primary means for the storage and organization of this knowledge. Experts can recognize patterns, communicate trends, and investigate coincidences from different regions. This process is included on Schacher's diagram as the MTAC's preparing the "change form". This human and technological knowledge system provides the analysts with resources needed to combine and organize relevant knowledge. The ongoing monitoring of the explicit knowledge base links and networks resources to ensure that the MTAC's archive unifies all available threat assessment knowledge. Effectively managing the KBS and inter-networking with regional specialists ensure that the explicit knowledge base is not degraded over time. This assimilation is designed to ensure that those analysts charged with making the knowledge product for the visiting units are properly equipped with the intelligence and understanding needed to make an accurate threat assessment.

c. Explicit to Tacit Knowledge Flow

Internalization is perhaps the most complex and subtle of the four knowledge flow transition processes. It is dependent on communication, distribution, and organized dissemination. Even the most complete and organized explicit knowledge base would be ineffective without it. The MTAC begins the internalization of the explicit knowledge when it forwards the pre-plan to the FPO afloat. Having drawn upon the resources available at MTAC, the planners provide recommendations and complete extraction of relevant explicit knowledge to be used in the command. The knowledge product that is delivered to the FPO and decision makers afloat are designed to convey

the understanding achieved thus far the in the knowledge construction process. A product of focused researched results emerges. The naval unit uses this knowledge to build its training program and force protection plan. The units using the MTAC's product should be able to operationalize the knowledge into an effective training program. Ultimately through this training and reorganization, the crew of the naval unit conducting the port visit will internalize this imparted knowledge. The actual product delivered is discussed later in this section.

d. Tacit to Tacit Knowledge Flow

Once the pre-plan has been forwarded to the decision makers, the tactical level planning begins. FPO and commanders formulate a comprehensive and knowledge-driven training program using the latest intelligence reports. It is the use of the MTAC's report as a basis for pre-planning that propels the creation of this force protection knowledge system. Using the pre-plan as a guidance tool, the FPO socializes and networks with the local NCIS agents and other intelligence sources to keep appraised of the current situation and conditions. Questions about certain specific information should be gathered from those sources in the geographic region. This HUMINT provides FPO with accurate first hand knowledge. Also, if another ship is rendezvousing in the same region, a social network should be established to appraise each command of preparations and plans. Consistency of plans and tactical situational awareness will further strengthen the group's unity of effort and will prevent certain miscommunication. During the port visit, the naval unit will see the results of a certain implemented COA. The 'on the spot' decisions and actions taken as a result of conditions encountered is also part of the socialization process. Communicating optimal plans to other vessels or commands in the region is a means of ensuring that tacit knowledge used is disseminated.

2. Vertical Scope Analysis

The supportive processes of organization, formalization, and distribution are interwoven in the MTAC's KBS functioning. In the KBS section of Chapter III and Section B of this chapter, it was asserted that proper organization and filing of forms, reports and conditions are fundamental to explicit knowledge credibility. Proper forms must be created in order to ensure useful storage and retrieval. These forms must be dynamic in order to change or be updated with new conditions. The networked structure

of the MTAC also aids in the speed and consistency of the information and knowledge. It also codifies and formalizes the knowledge base. Through structured queries and extraction, the knowledge from the KBS is coupled with the analysts' cognitive reasoning in order to make sense of the current conditions of an area under scrutiny. It combines the current conditions and new information with human reason in order to focus the results. The culmination of the formulization process is the creation of the threat analysis product or pre-plan. This pre-plan will be forwarded to the visiting unit and its ISIC. The security and integrity of this pre-plan and the knowledge product is dependent upon the network used. Planners rely on the design values of redundancy, security, and integrity to ensure that this plan makes it to the units uncontaminated. The distribution process is the last supportive process of the knowledge flow system. From it, all other processes use of the product created.

The performative processes of application, evolution, and creation are inherently combined with the human interaction and use of the KBS. The product delivered by MTAC is developed into the command's COA. The command takes into consideration the received knowledge and applies it to the situation at hand. The plan is tested practically in training exercises and events leading up to the port visit. FPO, commanders, and the ISIC all are responsible for any modifications to the force protection plan. Tacit knowledge accumulation increases once the training cycle begins. Once the ship is in port, the knowledge creation process is accelerated. Tacit knowledge increases as the duration of the visit extends. Reports and observations are made in order to generate complete and detailed after-action reports. The explicit knowledge creation process begins with the combination of past events coupled with the present conditions. Thus the cycle of knowledge creation from an operational point of view continues.

3. Contextual Analysis

Schacher has formulated processes that include environmental conditions and contexts. In the after-action report creation process, the old knowledge or past event is coupled with the conditions to which the knowledge is subjected. New knowledge is formalized and constructed in the face of new conditions or events. Past events and circumstances are stored in the MTAC archive as the old knowledge base is joined to the current conditions and events through human interaction. It is the KBS, the union of man

and machine that prepares the change form. Through this system, human cognition is joined to the immense search and processing power of information retrieval systems. It is done only with respect to the conditions for which it can be applied. The training cycle or application and evolution processes use updated environmental conditions gathered through networking with NCIS agents and other visiting ships. Throughout the major knowledge handling processes in the Schacher proposal, context is consistently weighed and examined to ensure that a level of credibility is attached to the knowledge used. This process verifies that the knowledge used results from all conditions of context. The Schacher proposal is designed to include contextual and environmental inputs.

D. KNOWLEDGE SYSTEMS AND ABSORPTIVE CAPACITY

The MTAC and systems surrounding the protection of naval forces require a robust and extensive absorptive capacity. They must be dynamic enough to keep pace with the ever-changing port environments. By identifying the different properties of ACAP within the MTAC and AT/FP knowledge flow system, the planners will be able to concentrate on improving those practices.

1. Acquisition

Schacher proposes a few different areas from which acquisition of new knowledge and information can be derived. Events that occur daily define the nature and patterns within a society and culture. Knowledge of them is needed to better define and codify the knowledge about that area. Other than the NCIS agents' daily gathering and sending of information back to the MTAC, acquisition processes in Schacher's system are limited. This might not allow for a dynamic ACAP for this proposed system.

However, the IDSEA knowledge management system does offer a greater use of acquisition processes and could incorporate some of these ideas into Schacher's proposal. The mining tools used to extract data and information from open sources is an example of an acquisition process. Establishing the different learning objectives defines an information structure and helps in the formulation of the data capture plan. It also is a basis for the search criteria. Therefore, the processes involved in shaping the learning objectives are indirectly a data and information acquisition plan. Because of the different ways in which the acquisition of new information can occur, the IDSEA KM system has

a fairly dynamic ACAP. It is flexible enough to shape and respond to changing circumstances.

2. Assimilation

Once a system embraces new information and knowledge, it must assimilate constructs and other information and knowledge in order to be used. In Schacher's plan, tactical units assimilate after-action reports from the past events and environmental conditions. It is the combination of these two inputs that helps to create a useful report. Also, the MTAC is able to assimilate new events and information with current conditions joining them into new knowledge. The cognition portion of Figure 4 is an illustration of the assimilation process. Therefore, Schacher's plan appears fairly robust in the assimilation of the information and knowledge once it is in the system.

3. Transformation

Transforming knowledge within a system is difficult task and determines how valuable the MTAC will be. In making the pre-plan and the formulating the knowledge product, MTAC analysts have to interact with local, regional, and global information and knowledge systems. By comparing reports, analyzing patterns, and establishing trends, subject matter experts and other MTAC workers are able to have a more comprehensive understanding of the knowledge at hand. In seeing knowledge through different schema and from different points of view, the analysts are expected to form a more informed and complete threat analysis. Transformation is a key process in establishing the usability of knowledge within this system. The idea of centralizing the knowledge organization and formalization processes helps to broaden the ACAP process of transformation.

4. Exploitation

The pre-plan and knowledge product that are created must be actualized practically to be effectively useful. The revision process involves using of the given product, but it does not constitute full exploitation of the product. The extent to which the pre-plan and knowledge product is used to formulate a productive and sufficient COA will be the determining factor on how well the pre-plan and knowledge product are exploited. A review of the exploitation of the knowledge product might come from the formulation of the after-action reports, for these reports call upon the past events and

conditions surrounding an event. Therefore how much of the effective portions of the COA used had its origins in the pre-plan and the knowledge product will help determine how much the product was exploited.

E. SUMMARY

Once the MTAC is established and operational, an audit should be done of its processes and practices to ensure that they contribute to the creation or management of knowledge. Because the different stakeholders in the AT/FP problem rely on the MTAC to efficiently produce a complete knowledge product, the structure and organizational design of the center should be closely monitored. If a static AT/FP system or one with a low ACAP is implemented, the government may be faced with another stovepipe system that is unable to grasp the scope of the problem at hand. MTAC planners and organizers must be well versed in the processes surrounding ACAP. The force protection system must be a model of efficient flows of information and knowledge. This organizational idea is a key function in the AT/FP threat assessment system. Therefore MTAC and AT/FP planners must engage in ACAP debates and targeting the processes that yield a greater ACAP.

THIS PAGE INTENTIONALLY LEFT BLANK

V. CONCLUSION

A. SUMMARY OF KNOWLEDGE FLOW SYSTEMS

The AT/FP's real tasks are that of knowledge construction and management. The different stakeholders and organizations associated with this problem play different but equally vital roles. The MTAC, which is currently in its forming stages, is designed to be the primary knowledge assimilating system. Those charged with defining and establishing the AT/FP systems and structures should be knowledgeable and up-to-date on the current discussions in the knowledge creation and management discussions. This paper should at least motivate further research and discussion into the appraisal of AT/FP systems with regards to knowledge constructs. To be of value to the fleet, the MTAC must be organized in an orderly fashion. Complete definition of roles, responsibilities, missions, and products must be established. Qualified analysts and subject matter experts must be employed to run the KBS at the MTAC.

Gordon Schacher's proposal gives the MTAC planners a working plan or outline that can be developed and refined. He has included processes and entities that are important for the creation, organization, formalization, distribution, application, and evolution of knowledge. The ACAP processes and practices of his system provide an ideal blueprint for a dynamic and modern system that is capable of keeping pace with the world it seeks to understand. With further studies and future research those planners entrusted with the institution of this knowledge flow system should become involved in examining the different aspects of knowledge construction and management. Different frameworks and schema can be used to analyze the AT/FP problem.

B. FUTURE RESEARCH

1. A Study on the Dimensions of Knowledge

This paper looked at the explicit/tacit dimension of knowledge as it pertains to the AT/FP problem. There are many different knowledge dimensions that are essential to the contemplation of this problem. Complexity, utility, embedded knowledge, and other categories must be included in the research. Viewing this problem through the different

dimensions of knowledge will be beneficial, because this is a knowledge management problem and needs to be treated as such.

2. A Vertical Analysis of the KMLCM

Once the MTAC has been created and processes and systems have been established, an appraisal of those process and practices using the KMLC model would yield a study with meaning. It would assist those leaders and managers of the MTAC in gauging the efficiency and productivity of the MTAC. The effectiveness and utility of those organization processes identified as not aiding one of the processes of creation, organization, formalization, distribution, application, and evolution should be questioned.

3. The MTAC Knowledge Product

The MTAC's ultimate goal is to produce a knowledge product capable of aiding those naval units traveling through or to a particular region. There are of course different debates about what this product should be. Because many officers worldwide will view the MTAC product and because humans learn differently, this product must be lenient enough to provide a degree of tailored access. As hinted in the second chapter, I recommend a product that combines both technical and social assets in an effort to codify this knowledge.

Using the latest technological assets available, a networked based, XML-generated three-dimensional graphical user interface should be constructed of the port region. This physical simulated environment will allow the user to go above, on, and below the water line to view the physical region from different angles. This layout will allow the user to gain the imagery necessary to plan force protection measures like personnel positioning, perimeter establishment, and force protection weapons deployment zones. However, this file would impart only a physical knowledge of the region. It does not take into consideration such environmental aspects such as social trends, religious movements, historical events, and political conditions. Therefore some networking based solution will be needed in order to capture the dynamic nature of these other conditions. Force protection officers should have the ability to contact the NCIS ashore agents and subject matter experts at the MTAC to satisfy questions.

For the aspects other than environmental, different maps can be constructed to show a region's ethnic dispersion, its economic conditions, its criminal problems, and its 'safe-havens.' The inclusion of reports about the area along with these maps will better translate the knowledge from the MTAC to the individual units. Having this file reside on a MTAC server will allow those ships the ability to access the file as needed. It will be updated by MTAC when new developments arise in a particular region. This will ensure that whenever a visiting command accesses the server, it will receive the most up to date file available. The ISIC will have access to the file and can make direct input into its unit's COA.

4. Vulnerabilities in the Force Protection Knowledge Flow Life Cycle

Managers of the AT/FP system must recognize how practice and process provide particular services to the knowledge flow system. The force will be threatened by any misunderstanding of certain roles that different groups should fulfill. Therefore, defined roles, missions, and responsibilities of certain segments or processes are key to a full understanding of the system. The vulnerabilities of the system must be documented so that special care can be taken to avoid them.

To protect the knowledge flow cycle against disinformation and knowledge corruption, every effort should be made to attach context to relative specific knowledge. Whenever this is not done, less useful knowledge could be overemphasized and could lead to an "information/knowledge overload."

5. Considerations for Testing of MTAC and AT/FP Procedures

IDSEA has conducted two LOE's that have sought to test the AT/FP plans and procedures. Every effort should be made to ensure that these tests are extensive and strenuous enough to try the many different aspects of the MTAC and its components. These experiments should not only test the immediate task of protecting the force, but also test the knowledge system's ability to locate, process, and use selected data and information. The use of Information Operations such as psychological operations, disinformation, and influence should be used to see how well our forces respond to such measures. Not all tests should end in success and likewise should not all result in a 'blue' defeat.

Effort and time should be spent testing the knowledge processes discussed, and testing the ability of the AT/FP system to adapt to change (i.e. test its ACAP). Each process that helps create, organize, formulate, etc. knowledge should be defined and scrutinized to ensure the usefulness of that process. Special tests should be conducted to help determine how well the AT/FP system responds to various loads of information and knowledge in order to attempt to gauge its absorptive capacity. It must take detailed exercises like these to ensure that the system is not institutionalized by the mistakes made after implementation.

C. PARTING THOUGHTS

In investigating the many aspects of AT/FP I remain convinced that proper and sufficient group training is necessary to ensure any successful port visit. The tacit knowledge gained from interacting with sailors who stand watches strengthens the command's ability to protect itself. Even with battlespace knowledge superiority, the tactical units will have to rely on the training of the crew. It is their performance in distressful situations that oftentimes determines the success of an engagement. Sailors should look not only for troublesome situations while in port, but should expect the unexpected. Incidents should be reported through their chain of command. The most reliable form of intelligence gathering is HUMINT. It should be utilized locally to gain the first-hand knowledge of the area. However, with all the proper foresight and threat assessment, there must be a strong and competent force ready to met the dynamic challenges of the port environment.

LIST OF REFERENCES

Arquilla, John, David Ronfeldt, *Networks and Netwars: The Future of Terror, Crime and Militancy*, Santa Monica, Calif.: RAND, 2001.

Bates, David Homer, *Lincoln in the Telegraph Office*. University of Nebraska Lincoln. 1995.

Davenport, T.H., and L. Prusak, Working Knowledge: How Organizations Manage what they Know (Boston, MA: Harvard Business School Press, 1998).

Harney, James, Web-Based 3D Reconstruction of Scenarios for Limited Objective Experiments, to be published in Proceedings of the 2002 Summer Computer Simulation Conference, Society for Computer Simulation, 2002.

Koestler, A.. 1966. *The Act of Creation.* London: Hutchinson. 1966.

Nissen, M.E., Facilitating Naval Knowledge Flow, Naval Postgraduate School, July, 2001.

Nissen, M.E., M. Kamel, K. Sengupta; "Integrated Analysis and Design of Knowledge Systems and Processes," Information Resources Management Journal, Idea Group Publishing, Jan-Mar, 2000.

Nonaka, I. "The Knowledge-Creating Company." Harvard Business Review on Knowledge Management. Harvard Business School Press. 1998.

Nonaka, I., and T. Nishiguchi. Knowledge Emergence. New York, New York. Oxford University Press INC. 2001.

Nonaka, I.. "The Knowledge-Creating Company." Harvard Business Review on Knowledge Management. Harvard Business School Press. 1998.

Oxendine, E., and M. E. Nissen, "Knowledge Process and System Design for the Carrier Battle Group," Knowledge and Innovation: Journal of the KMCI, Vol 1, No 3. April 15, 2001.

United States Joint Chiefs of Staff. Joint Vision 2020. June 2000.

Zahra, S.. and G. George. "Absorptive Capacity: A Review, Reconceptualization, and Extension." Academy of Management Review. 2002, Vol. 27, No. 2.

THIS PAGE INTENTIONALLY LEFT

INITIAL DISTRIBUTION LIST

1. Defense Technical Information Center
   Fort Belvoir, VA

2. Dudley Knox Library
   Naval Postgraduate School
   Monterey, CA

3. Department of the Navy
   Office of the Chief of Naval Operations (N6109)
   Washington DC

4. Fleet Information Warfare Center
   255 Amphibious Drive
   Norfolk, VA

5. LCDR Steven J. Iatrou
   Naval Postgraduate School
   Code IW/IS
   Monterey, CA

6. Gordon Schacher
   Naval Postgraduate School
   Institute for Defense Systems Engineering Analysis
   Monterey, CA

7. Shelley Gallup
   Naval Postgraduate School
   Institute for Defense Systems Engineering Analysis
   Monterey, CA

8. Erik Jansen
   Naval Postgraduate School
   Code IW/IS
   Monterey, CA